Currency Crises and Economic Monetary Cooperation

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Currency Crises and Economic Monetary Co-operation: An Application to South East Asia, and Comparison with Mexico, Brazil, and Europe

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Abstract

Currency crises in Europe (1992-93), Mexico (1994-95), East Asia (1997), and Brazil (1998-99) again have drawn worldwide attention to speculative attacks on the so-called "government-controlled" exchange rates. This paper is to show that some macroeconomic variables that matter in emerging market crises, such as the lending boom and real exchange appreciation, seem to be also helpful in explaining the fundamental situation on the eve of the European Exchange Rate Mechanism (ERM) crisis in 1992-93. This indicates that macroeconomic stability is still one of the necessary conditions to successfully operate an economic monetary cooperative mechanism - a choice some leaders of emerging economies make to resist next speculative attacks.

Keywords: currency crises, ERM, emerging markets, macroeconomics

1. Causes of Currency Crises[1]: Academic Points of View

Many countries have sought to stabilize their currencies in foreign exchange markets since the collapse of the Bretton Woods system in the early 1970s. Unfortunately, their efforts often fail after speculative attacks, which also lead governments to deplete their foreign exchange reserves. On the one hand, it seems that currency crises have become harder to resist and more widespread, as international capital markets have deepened since the 1970s.[2] On the other hand, the main streams of relevant academic investigations since the 1970s, such as the first-generation (or exogenous-policy) and second-generation (or endogenous-policy) models, also indicate speculative attacks are not only possible, but also inevitable[3] under some conditions. To have readers understand the theoretical background of our work here, we simply classify two main causes of currency crises as follows:[4]

1.1 Pure macroeconomic weakness: First-generation models and their extensions

The story of first-generation models[5] is usually started from a small open economy with some simple assumptions (e.g., purchasing power parity, interest rate parity, in a world of certainty, monetary equilibrium described by the famous Cagan money demand equation, etc.). Fixing the exchange rate ($\bar{s}$) in terms of a large foreign partner is the responsibility of the domestic government. Basically, their analysis of the model revolves around private and government actions in the domestic money market.

The main points of the canonical model are as follows. To find the timing and size of the attack, these economists introduce the idea of a "shadow exchange rate" ($\tilde{s}$), which is defined to be the floating

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[1] A *currency crisis* may be said to occur when a speculative attack on the exchange value of a currency results in a devaluation (or sharp depreciation) of the currency, or forces the authorities to defend the currency by expending large volumes of international reserves or by sharply raising interest rates. See IMF (1998), pp.74-75.

[2] Obstfeld and Rogoff (1996) provide us two cases: The United Kingdom is rumored to have lost over $7 billion within a few hours trying to defend off the September 1992 attack that forced the pound off its peg against the Deutsche mark. Mexico's 1994 intervention to support the peso-dollar rate exceeded $50 billion, yet it failed to prevent the currency's collapse at the year's end.

[3] Obstfeld and Rogoff (1996), p. 559.

[4] Note that using this classification is just for the purpose of simplification and consistency with our topic, though it may not be the same as classifications in other papers.

[5] The canonical first-generation models are developed by Salant and Henderson (1978), Krugman (1979) and Flood and Garber (1984). Many economists contribute to the second-generation models. The details of the story can be found in Flood and Marion (1998).

exchange rate that will prevail if speculators purchase the remaining government reserves used for the fixed rate and the government refrains from foreign exchange market intervention thereafter. Since speculators can foresee a capital gain when $\tilde{s} > \bar{s}$ caused by high growth of domestic credit, a foreseen attack will take place when $\tilde{s} = \bar{s}$. That is, the domestic interest rate must jump upward to reflect prospective currency depreciation and interest rate parity. As for the timing of the attack, high initial stock of reserves and low growth rate of credit expansion will lead the fixed exchange rate regime to sustain for a longer time. The first-generation models are modified by taking other factors (e.g., sterilization policy, bond market, risk and uncertainty) into account.[6] These modifications make first-generation models not only more realistic, but also more explainable for the recent cases.

Before the cases of the 1990s, currency crises were thought to have a significant predictable component by the standard first-generation models that consider fundamentals useful in prediction. This idea was also supported by empirical studies of the pre-1990s currency crises.[7] Some empirical work still argue that there exist **fundamental weakness** and **international propagation** in recent currency crises. For instance, Table 1 shows rough evidence to support the "wake-up call"[8] hypothesis: Thailand had the worst fundamentals, which was followed by Indonesia. Malaysia and the Philippines were in between. Hong Kong and Singapore were still the least affected by their neighboring countries, although they had the strongest fundamentals in East Asia.[9]

1.2 Mixed causes: Second-generation models and their extensions

The most famous second-generation model is by Obstfeld (1996): The government observes the state of private expectations, and then minimizes the social loss function regardless of the current state of the economy. The private sector expects the goals of the government (including depreciation), and it turns out to be optimal for the government to validate such an expectation. In this structure, the government should adopt a mixed strategy — usually it decides on the expected value of loss functions according to the private sector's expectations. However, discretion may be better when the rule cannot stipulate the course of action for every possible shock that could hit the economy. That is,

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[6] See Flood and Marion (1998), pp. 8-12.

[7] In these works, some factors stressed by the first-generation model, such as fiscal deficit financed by domestic credit, budget deficit monetization causing gradual decline in international reserves, inflation leading to a severe real exchange appreciation and current account deficit, were good indicators in the cases of Latin America during the period from the 1950s to the 1980s.

[8] Goldstein and Hawkins (1998) proposes that creditors are "awakened" by a crisis in one country and proceed to reassess the creditworthiness of others. See Ahluwalia (2000), p. 4.

[9] This can be shown in the values of "crisis indices." in Section 2 and 3.

tightening the commitment to the fixed rate may push a country toward a currency crisis, regardless of the fundamental situation. The ERM case of 1992-93 may be an example of this model.[10]

Due to the above models' unsatisfactory explanations of the recent currency crises in emerging markets, economists try to make improvements by adding some special factors into the models. Corsetti et al. (1999) stress **moral hazard**, which represented a hidden subsidy to invest via implicit government guarantees to banks, cronies of politicians, etc., as a common source of overinvestment, excessive external borrowing, and current account deficits. Alternatively, Radelet and Sachs (1998) and Chang and Velasco (1998) argue that Asian countries did not do anything wrong but suffered from **financial fragility** that made them vulnerable to self-fulfilling pessimism on the part of international lenders. They claim that the story of the Asian case is similar to Diamond-Dybvig's bank runs:[11] financial intermediaries became vulnerable to self-fulfilling panics, in which fear of losses leads depositors to demand immediate payment, forcing destructive liquidation of long-run investments. However, Krugman (1999, 2000a), one of the founders of the first-generation models, doubts that the above two explanations are adequate to the task of explaining the severity of the Asian case. He points out three facts that a model should probably address: first, contagion with **multiple equilibria**, which is useful to explain that countries are vulnerable to self-fulfilling pessimism in confidence triggered by faraway economies. Second, a loss of confidence leads to the **transfer problem**, which induces the need to achieve the current account counterpart of a reversal of capital flows either via real depreciation or via recession.[12] And third, **balance sheet problems**, which implies a disastrous effect caused by the explosion in the domestic currency value of dollar debt held by domestic firms, lead to a slow recovery since the firms' capital has been wiped out by the combination of declining sales, high interest rates, and a currency depreciation.[13] We may call the above tries *"third-generation"* models, which should be helpful to understand the nature of recent currency crises of emerging markets in the 1990s, in spite of many conflicts among their arguments.[14]

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[10] For instance, the desire to be part of a political economic union, where maintaining a fixed exchange rate is a condition for membership, may trigger the effect of "political contagion." See Drazen (1999).

[11] For details of bank runs by a stage game, see Gibbons (1992), pp.73-75.

[12] Obviously, Krugman adopts the Keynesian point of view. For the debate between Keynes and Ohlin, see Rogoff and Obstfeld (1996), pp. 255-56.

[13] According to this point of view, the problem of non-performing loan did not result in, but resulted from, the Asian crisis in 1997.

[14] As Krugman (1999) said, we badly need a "third-generation model" both to make sense of the recent crises and to help warn of crises to come, but the world seems to keep finding new ways to generate crises.

As for the empirical evidence, the speculative attacks of the 1990s, particularly those happening in Europe, challenged the point of view of the first-generation models. This is why many researchers have turned to exploratory empirical models that use a wide variety of variables, not only fundamental but also non-fundamental, to test whether these different approaches can be more persuasive than those used before. More and more economists believe that crises can be triggered by **pure contagion**[15] and **herd behavior**,[16] in which we may find neither real links nor common shocks among economies. That is, they may not be caused by any external and internal fundamental weakness.

In sum, an important characteristic of these theoretical models is the attempt to determine whether a currency can be attacked without justifiable deterioration in the "fundamentals."[17] In this regard, some other economists begin to find the main factors (fundamental or non-fundamental) of currency crises through different empirical ways. There is a still growing literature trying to test fundamentals using different methods. Readers are invited to check the Asian financial crisis homepage (http://www.stern.nyu.edu/~nroubini/asia/acadresearch.htm) and other internet websites by famous international research institutes (http://www.imf.org; http://www.nber.org) to see the recent information about publications and seminars.[18]

2. A Theoretical Explanation of Currency Crises[19]

After the above general review, in this section we use a simple model to explain the main causes of currency crises in the 1990s. Following Plasmans et al. (1998), each investor decides how many domestic and foreign assets she wants to hold after evaluating the economic outlook of the domestic area and her private expectation for the exchange rate[20]

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[15] The crisis may be triggered by the investors who, according to the information available at certain times, believe that the currency is going to be devalued — the so-called self-fulfilling rational expectation. This suggests high market co-movements during periods of recent crises (e.g., the 1997 East Asian crisis, the 1994 Mexican Peso collapse, the 1987 U.S. stock market crash) may not be caused by the pure contagion effect but by a continuation of strong cross-market linkages, say, interdependence. See Forbes and Rigobon (1999)

[16] Herd behavior will be provoked when one investor attacks the currency after observing others doing the same thing. See Bikhchandani and Sharma (2000).

[17] Note that there is no general agreement on the definition of fundamentals. It depends on economists' focuses.

[18] National Bureau of Economic Research (NBER) recently published some books collecting seminar papers, including Krugman (2000b), Ito and Krueger (2001), Dooley and Frankel (2001), Feldstein (2001), Edwards and Frankel (2001).

[19] The structure of this subsection is mainly based on Cagan (1956), Girton and Roper (1977), and Flood and Marion (1996).

[20] The reduced form for the nominal exchange rate can be written by synthesizing flexible-price monetary model (FPMM), sticky-price monetary model (SPMM), and portfolio balance model (PBM)

$$\bar{e}_t = (m_t^s - m_t^{sf}) - \beta_t \times (y_t - y_t^f) + \alpha_t[(I_{t+1} - I_{t+1}^f) - (I_t - I_t^f)] \quad (1)$$

(1) shows the depreciation rate ($\bar{e}_t$) sustained by the relative economic outlook of the domestic area and relative PPP should be a good indicator to respond to the real value of an exchange rate denominated by domestic currency in a long-run point of view.[21]

Investor *i* will form her expectation according to available information and her attitude toward risk and uncertainty.

$$e_{i,t}^e = (I_t - I_t^f) - Z_{i,t-1}V_{i,t-1} \times [C_{i,t-1} + (\ln K_{i,t-1} - \ln K_{i,t-1}^f - \ln E_{t-1})] \quad (2)^{22}$$

If the investor's expectation rate of depreciation is larger than the PPP value of the depreciation rate sustained by the economic outlook of the domestic area ($e_{i,t}^e > \bar{e}_t$), it means she may change her portfolio (capital outflow) immediately in order to get capital gains at time *t*.[23] Combining (1) and (2), we can define investor *i*'s strategy.

$$0 \le \Delta K_{i,t}(e_{i,t}^e) \le K_{i,t} + constant \quad \text{if} \quad e_{i,t}^e \le \bar{e}_t \text{ (Capital inflow)} \quad (3)$$

$$-K_{i,t} \le \Delta K_{i,t}(e_{i,t}^e) < 0 \quad \text{if } e_{i,t}^e > \bar{e}_t \text{ (Capital outflow)}$$

Assume an extreme case in which all investors follow the same decision rule. Investors will choose e_t^e, then decide on ΔK_t, before observing the actual depreciation rate, e_t.

$$0 \le \Delta K_t(e_t^e) \le K_t + constant \quad \text{if } e_t^e \le \bar{e}_t \text{ (Capital inflow)} \quad (4)$$

$$s_{i,j,t} = f_{ij}(r_{i,t}, r_{j,t}, m_{i,t}, m_{j,t}, ip_{i,t}, ip_{j,t}, \pi_{i,t}, \pi_{j,t}, TB_{i,t}, TB_{j,t}, s_{1j,t} \ldots s_{nj,t}) + \varepsilon_{ij,t} \qquad \varepsilon_{ij,t} \sim I(0)$$

where j means the United States. r nominal short-term interest rate, m nominal money supply, ip industrial production, π inflation rate, TB the cumulated trade balance. See Plasmans et al. (1998).

[21] It is clear that a higher growth of money supply (m_t^s), a lower growth of real income (y_t), a higher interest rate at time *t+1* (I_{t+1}), and a lower interest rate at time *t* (I_t) in the domestic area relative to those in the foreign area will increase the pressure of depreciation for the domestic area at time *t*. Superscript *f* represents variables of the foreign area. Here we assume that the exchange rate system of the domestic area is neither a perfect float nor perfectly fixed ($\bar{e} = 0$).

[22] *Z*V* summarizes how desired asset holdings are influenced by tastes for risk and uncertainty about return. *E* means the exchange rate denominated by the domestic currency.

[23] There are different explanations for the case of investors' expectations (e.g., Furman and Stiglitz, 1998) using forms similar to equation (2).

$-K_t \le \Delta K_t(e_t^e) < 0$ if $e_t^e > \overline{e_t}$ (Capital outflow) where $K_t \equiv \sum_{i=1}^{N} K_{i,t}$

2.1 The Government's reaction[24]

Given investors' behavior, $\Delta K_t(e_t^e)$, the government will choose a change in reserves ΔR_t, a depreciation rate e_t, and an unemployment rate u_t, to minimize its loss function. δ measures how the government cares about u_t. We assume $E_{t-1} = 1$ for simplicity.

$$\underset{\Delta R, e, u}{Min} \sum_{t=0}^{\infty} (e_t - \overline{e_t}) + \delta (u_t - \overline{u_t}) \qquad (5)[25]$$

$$s.t. \Delta R_t = CA_t + KA_t = CA_t + \frac{\Delta K_t}{1 + e_t}$$

$$\Delta R_t \ge -R_t \qquad e_t \ge 0 \qquad u_t \in [0, \overline{u_t}(lb_t)] \qquad \frac{\partial u_t}{\partial lb_t} < 0$$

Here CA_t and KA_t are the current account and the capital account respectively, and lb_t is the lending boom, the growth of lending to enterprises, which may be from foreign borrowing under the government's implicit guarantees in the banking sector.

The government can adopt a depreciation policy, a recession policy, or both at the same time, to improve the current account. In theory and empirical evidence, the two policies have the same effect on the trade balance in the short run,[26] which means there should be a strengthening effect if the government adopts both. That is, the "depreciation effect" (*DE*) and the "recession effect" (*RE*) can be presented by two government policy goals, e and u.

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[24] The structure of this subsection is mainly based on Roubini (1998), Tornell (1999a, b), and Krugman (1999, 2000a).

[25] We set the relationship between *u* and *lb* according to the 1997 Asian case (e.g., South Korea).

[26] The difference between the two policies is to be found in their short-term dynamics. The cost of the devaluation policy is that there will be inflation, while the recession policy may take a long time to be successful if the degree of wage and price flexibility is limited. See De Grauwe (1997), pp.29-33. Note that the government should consider the "J-curve" effect.

$$CA_t = DE_t + RE_t$$
$$= [\theta_t(rer_t^{t-s}) \times \eta_t \times e_t + \sigma_t \times u_t(lb_t) - \omega_t(rer_t^{t-s})] + [\gamma_t \times e_t + \rho_t \times u_t(lb_t)] \quad (6)^{27}$$
$$\frac{\partial \theta_t}{\partial rer_t^{t-s}} > 0, \qquad \frac{\partial \omega_t}{\partial rer_t^{t-s}} < 0$$

Given the government's reaction to the investors' strategy, four cases can be considered in terms of the international liquidity level of the country. Here we just mention the situation that the foreign reserves are in an intermediate range ($\pounds S \leqq R < K + \pounds S$) and investors' expectations are unstable. Then we will get either (7) or (8)

$$e_t^* = \sqrt{\frac{\delta K_t}{\rho_t + \sigma_t - \delta(\theta_t \eta_t + \gamma_t)}} - 1 \quad (7)$$

$$\mu_t^* = \frac{1}{\rho_t + \sigma_t}\left\{\frac{\rho_t + \sigma_t - 2\delta(\theta_t \eta_t + \gamma_t)}{\sqrt{\delta[\rho_t + \sigma_t - \delta(\theta_t \eta_t + \gamma_t)]}}\sqrt{K_t} + \theta_t \eta_t + \gamma_t + \omega_t - R_t\right\}$$

$$e_t^*(\Delta K_t) = \frac{-[\theta_t \eta_t + \gamma_t + (\sigma_t + \rho_t)\bar{\mu}_t - \omega_t + R_t] + \sqrt{[\theta_t \eta_t + \gamma_t + (\sigma_t + \rho_t)\bar{\mu}_t - \omega_t + R_t]^2 - 4(\theta_t \eta_t + \gamma_t)[(\sigma_t + \rho_t)\bar{\mu}_t - \omega_t + R_t - K_t]}}{2(\theta_t \eta_t + \gamma_t)} \quad (8)$$
$$\mu_t^*(\Delta K_t) = \bar{\mu}$$

The intuition behind (7) and (8) is as follows: once reserves are depleted, the external gap has to be closed by either a nominal devaluation policy or a recession policy. If the gap ($K_t + \omega_t(REX_{t-s})$) is not very large and will not push the unemployment rate to the upper bound of unemployment ($\bar{\mu}$), the government can still consider the trade-off relationship of costs and benefits between unemployment and nominal devaluation measured by $\rho + \sigma$ and $\theta\eta + \gamma$ in equation (6). However, if the external gap is too large, which may lead the optimal unemployment rate to go beyond the upper bound $\bar{\mu}$, then the government has to keep the unemployment rate $\bar{\mu}$ unchanged and close the external gap through a further depreciation.

2.2 The multiple equilibria for the fundamentals in the stage game[28]

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[27] η, σ, γ, ρ are the contributions of the devaluation and recession policies represented by *e* and *u*. If the government just adopts the devaluation (recession) policy, then σ and ρ (η and γ) should be equal to zero. The variable rer_t^{t-s} means the degree of the real exchange rate appreciation from time *t-s* to *t*. The lower the negative value of *rer*, the less the real exchange rate is appreciated. θ_t indicates how effective a new devaluation policy is in improving the current account. $-\omega_t$ captures the negative effects of past real appreciation on today's current account.

[28] We construct this subsection following Barro and Gordon (1983) and Tornell (1999a, b). The first stage is to look at the private behavior. Second the government tries to get the optimal policy after observing the private behavior. Then we get the final outcomes by combining the above two stages.

Combining investors' and the government's optimal choice by the rational expectation ($e^e = e^* = e$), we can get three cases. Here we just discuss the case of the multiple equilibria:

If $\bar{e}_t \in [e_t^*(0), e_t^*(-K))$ then two equilibria are possible:

$$\Delta\tilde{K}_t = 0 \qquad \text{and} \qquad \tilde{e}_t = e^*(0) \quad \text{or}$$

$$\Delta\tilde{K}_t = -K_t \text{ and } \tilde{e}_t = e_t^*(-K_t)$$

where $\tilde{e}_t$ means the final outcome. If investors believe that the devaluation will be greater than $\bar{e}_t$ and then withdraw their capital from the country, this will lead the devaluation to be indeed greater than $\bar{e}_t$ and then trigger off a crisis. On the other hand, if investors believe that the devaluation will not be greater than $\bar{e}_t$, then a crisis will not happen in the country. That is why **a country may suffer the currency crisis triggered by the international propagation mechanism, a possible effect resulting from fundamentals or self-fulfilling expectations**. Figure 1 summarizes the case

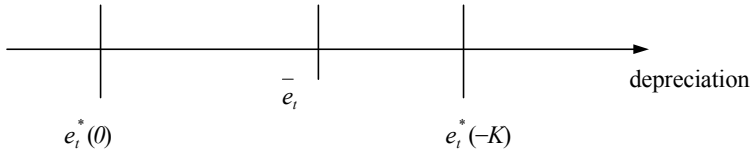


Fig. 1. Possible equilibria

3. The Empirics for East Asia, Mexico, and Brazil

Following the theoretical and empirical models by Sachs et al. (Sachs-Tornell-Velasco model, STV, 1996), Tornell, and Yeh (2000a, b), in which they point out the importance of changes in the real exchange rate, the level of lending boom in the banking sector, and the level of international liquidity in the development of currency crises, we construct a basic regression model

$$\begin{aligned} IND_{i,t} = {} & \beta_0 + \beta_1 \times rer_{i,t} + \beta_2 \times lb_{i,t} + \beta_3 \times rer_{i,t} \times DHR + \beta_4 \times lb_{i,t} \times DHR \\ & + \beta_5 \times rer_{i,t} \times DSF + \beta_6 \times lb_{i,t} \times DSF + \varepsilon_{i,t} \end{aligned} \tag{9}$$

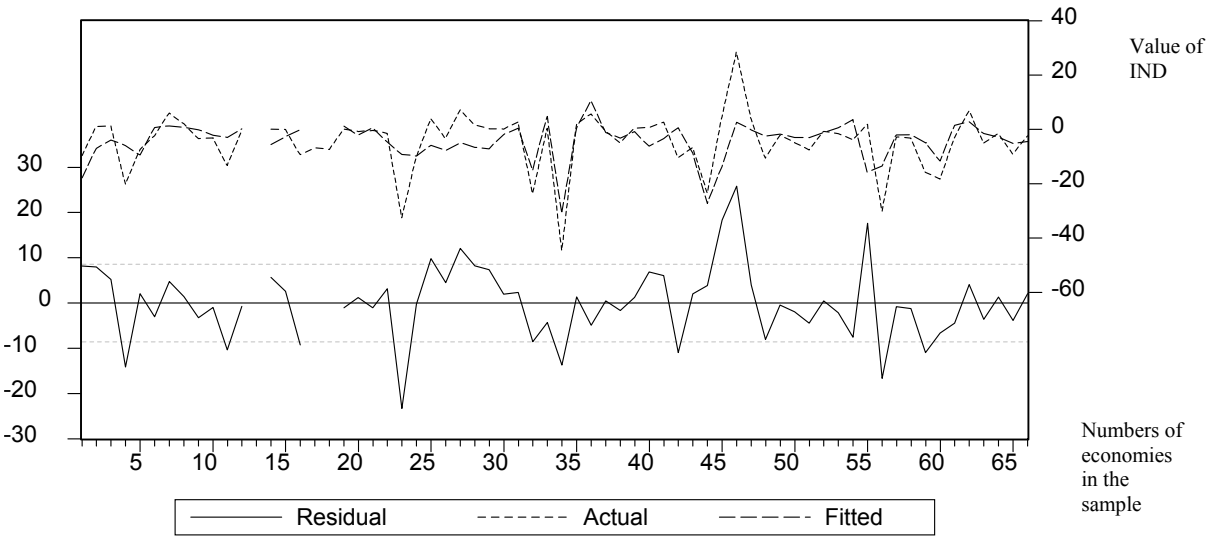
Where *i* means economies in our samples, and *t* represents three currency crises happening in 1995 (Mexico), 1997 (East Asia), and Brazil (1999), respectively.

Here we simply introduce how we construct these variables:

Crisis index (IND): The idea of *IND* is based on the negative "exchange market pressure,"[29] the left-hand side of equation (9). The standard definition of *IND* is widely used by other relevant empirics.

$$IND = \left[\frac{\frac{1}{V_{\Delta E}}}{\frac{1}{V_{\Delta E}}+\frac{1}{V_{\Delta R}}} \times \Delta E \times (-1)\right] + \left[\frac{\frac{1}{V_{\Delta R}}}{\frac{1}{V_{\Delta E}}+\frac{1}{V_{\Delta R}}} \times \Delta R\right] \qquad (10)^{30}$$

Figure 2 The actual and fitted crisis indices (IND)



Note: Selected 66 economies in our sample. The larger negative value of the IND is, the higher possibility for the country to suffer from the currency crisis.

Source: Author's computation

The rationale for measuring the crisis in this way is that authorities will typically respond to an attack by running down reserves and depreciating the exchange rate. The weights given to the loss in reserves (ΔR) and the devaluation (ΔE) are country-specific, and they are inversely related to the relative variance ($V_{\Delta E}$ and $V_{\Delta R}$) of each series. So the crisis indices are weighted averages of the loss in international reserves and the depreciation against the U.S. dollars. The initial point is the month before the onset of the crisis (e.g., November 1994, May 1997, and November 1998, for the Mexican,

[29] The original definition by Girton and Roper is "a measure of the volume of intervention necessary to achieve any desired exchange rate target" (p. 537). Monetary authorities can try to keep a fixed exchange rate or avoid exchange rate adjustment by engaging in foreign exchange market intervention.

[30] Eichengreen et al. (1995), whose work concentrated on developed countries in the ERM crisis, also include the level of the domestic interest rate in their indices, while Kaminsky et al. and Sachs et al. dropped this component since data are missing on certain developing countries in the sample. Here we follow the definition used by the latter.

East Asian and Brazilian crises, respectively). Then we vary the terminal month over a period of six months starting in January 1995, July 1997, and January 1999, also for the mentioned countries, respectively. Note that we adopt the definition made by Corsetti et al. (2000): the higher negative value of *IND*, the stronger exchange rate pressure the government faces. So the first term on the right-hand side of equation (10) should be multiplied by minus 1. Figure 2 shows the values of actual and fitted *IND* of the selected economies in our sample.

Real exchange rate (rer): The real exchange rate is a weighted average of the bilateral real exchange rates of a country with respect to the U.S. Dollar, the Japanese Yen, and the Deutsche Mark. The weights add up to 1 and are proportional to the shares of bilateral trade in the country with the United States, Japan, and the European Union.[31] Following Tornell and Ahluwalia, we measure the rate of real appreciation, that is, the percentage change over the four years prior to the onset of the crisis.[32] The higher negative value of *rer*, the more severe real exchange appreciation the government faces.

Lending boom (lb): Here we adopt the definition of the real percentage increase in loans provided by the banking sectors to the private sectors and state-owned enterprises.[33] We do not use the non-performing loan here, since the latter is available neither on a timely basis nor in data sources which ensure cross-country comparability,[34] and there should be a positive relationship between the former and the latter.[35] We can imagine that a lending boom will weaken the banking sector of a country, even though the country is experiencing a strong economic growth. That is, the higher positive value of *lb* is, the weaker banking sector the country has.

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[31] In the case of the ERM crisis, the term of European Union will be replaced by that of Germany. See the following context.

[32] We define the initial and ending points following Tornell. In traditional wisdom there is an unavoidable "base-year problem" to measure the real exchange appreciation (e.g., see Edwards and Savastano, 1999). However, we still try to make our definition reasonable. For instance, we focus on economic situations of emerging markets in the 1990s and use the same four-year interval to make three cases a consistent base. We use the end of 1994 as an initial point for the Brazilian case, since Brazil issued a new currency, the Real, in July 1994.

[33] Another definition of percentage change in the ration of loans over GDP is also available, but we do not report the result here because it does not outperform the real percentage increase of loans in our empirics. For the details, see Yeh (2000a).

[34] Note that Corsetti et al. still use the non-performing loan as an independent variable of the regression model and get a significant result, though there is a misreporting problem or the so-called "evergreen accounts problem" in the non-performing loans. See Tornell, p. 13.

[35] There are several reasons to support this argument. First, the banks of emerging markets have limited ability to evaluate projects. Second, regulatory agencies in developing countries have limited capacity and resources to monitor the banking sectors. Third, it makes sense that there are few projects with high-expected returns and low variance in emerging markets. See Tornell, p. 13.

The dummy high foreign reserves (DHR): We define this dummy to be equal to 1 if a country has a low ratio of M2 to foreign reserves; otherwise, it is equal to 0. With the data in 1991 for the European countries, in 1994 for Mexico, in 1996 for Asia, and 1998 for Brazil,[36] we compute the government's liquidity by the ratio of M2 to foreign reserves and use it to define the dummy in different ways.[37] M2 is not only the monetary base, but also the relevant proxy of the central bank's contingent liabilities. The basic idea is that if the government has high international liquidity (lower ratio of M2/Reserves) and is willing to defend the exchange rate, then it will be able to exchange the amount of money withdrawn by depositors for foreign currency and act as a lender of last resort.

The dummy strong fundamentals (DSF): We define this dummy to be equal to 1 if a country has "strong fundamentals" based on our theory; otherwise, it is equal to 0. There are also different ways to define this dummy. The key point is that we combine the situations of real exchange rate and lending boom to decide the value of the dummy for each country.

The relevant theoretical models we mentioned above and equation (9) imply that when there are **financial fragility** and **external imbalances** in a country, the government will face the high pressure of the crisis pushed by past severe real exchange appreciation ($\beta_1 > 0$) and large lending boom ($\beta_2 < 0$). The effects of the real appreciation and the lending boom for the case of high reserves are captured by $\beta_1 + \beta_3$ and $\beta_2 + \beta_4$. In the case of strong fundamentals, these effects are captured by $\beta_1 + \beta_5$ and $\beta_2 + \beta_6$. If there is no fragility and external imbalances (*DHR*=1 or *DSF*=1), neither a greater lending boom nor a greater appreciation will have effects on the investors' decision to attack. That is, $\beta_1 + \beta_3 \le 0$, $\beta_2 + \beta_4 \ge 0$, and $\beta_1 + \beta_5 \le 0$, $\beta_2 + \beta_6 \ge 0$[38]. Alternatively, we may consider the possibilities of **multiple equilibria** and crises spreading by a random way if the above fundamental assumptions cannot be sustained.

After some econometric tests we confirm our empirical model is appropriate for the cases of emerging markets by a simple ordinary least square (OLS) form.

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[36] We define the dummy using annual data, which is different from Sachs et al. and Tornell. The reasons are that investors should look at not only the current situations but also at the government's behavior in the previous year.

[37] For instance, M2/Reserves by its first-log-difference standard deviation is also feasible.

[38] We test $\beta_1 + \beta_3 = 0$, $\beta_2 + \beta_4 = 0$, $\beta_1 + \beta_5 = 0$, $\beta_2 + \beta_6 = 0$ in the paper.

3.1 Empirics of emerging markets in the 1990s

The first step of our empirical analysis is to get initial results as a benchmark. We stack 33 developing countries (or regions)[39] in the 1995, 1997, and 1999 crises, and then make an estimation through our empirical model.

3.1.1 Currency crises of emerging markets in the 1990s

The initial regression results are in the first column of Table 2. Despite the significance of coefficients in real exchange appreciation and lending boom, the results of Wald-test do not fully support the idea that currency crises do not spread randomly. In other words, it is still possible for a country with high reserves and strong fundamentals to suffer a currency crisis. In this case, it might be of no use for the government to defend the exchange rate because of international propagation mechanisms or the so-called multiple equilibria.

3.1.2 Asian crisis in 1997

Next, we test the individual cases respectively and focus on the East Asian case. First we see that real exchange appreciation is not significant. Second we can also test whether the coefficients of *rer* and *lb*, say β_1 and β_2, are the same in the three periods. Here we add four terms, *rer*D97*, *rer*D99*, *lb*D97*, and *lb*D99*, to our benchmarks. Note that *D97* and *D99* are dummy variables, which take the value of 1 for observations that correspond to the 1997 and 1999 cases. For instance, the effect of *rer* on the crisis index is β_1 for the 1995 case, $\beta_1+\beta_7$ for the 1997 case, and $\beta_1+\beta_8$ for the 1999 case. Therefore, the null hypothesis is β_7=0, β_8=0. For the same reason, we expect β_9=0, β_{10}=0. The results in Table 2 are consistent with the null hypothesis, which means the coefficients of *rer* and *lb* are the same in the three periods.

3.1.3 Is it possible to predict crises by past experience?

Another interesting issue is whether we can predict future crises using past experience. We construct an out-of-sample predictive crisis index by substituting two elements for equation (9): First, we estimate the crises in 1995 and 1997 respectively and get coefficients of regressions. The regression results are shown in Table 2. Second, the values of explanatory variables that correspond to the cases in 1997 and in 1999 are also available.

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[39] 33 countries are Argentina, Brazil, Chile, Colombia, H.K., Hungary, India, Indonesia, S. Korea, Jordan, Malaysia, Mexico, Pakistan, Peru, the Philippines, Poland, S. Africa, Sri Lanka, Thailand, Turkey, Venezuela, Zimbabwe, Singapore, Bolivia, Costa Rica, Dominican Republic, Ecuador, Guatemala, Haiti, Honduras, Israel, Nicaragua, and Uruguay.

To measure how well the out-of-sample prediction fits the actual crisis indices of 1997 and 1999, we regress the actual indices on the predicted out-of-sample crisis indices:

a. Predict the crisis in 1997 using the experience in 1995

$$97\ IND_i = \underset{(1.522)}{-4.960} + \underset{(0.200)}{0.627} \times (\textit{predicted}\ 97\ IND_i\ \textit{using data in}\ 95)$$

$$R^2 = 0.248 \qquad \overline{R}^2 = 0.222$$

b. Predict the crisis in 1999 using the experience in 1995

$$99\ IND_i = \underset{(1.433)}{-3.817} + \underset{(0.132)}{0.026} \times (\textit{predicted}\ 99\ IND_i\ \textit{using data in}\ 95)$$

$$R^2 = 0.001 \qquad \overline{R}^2 = -0.036$$

c. Predict the crisis in 1999 using the experience in 1997

$$99\ IND_i = \underset{(1.374)}{-3.735} - \underset{(0.094)}{0.015} \times (\textit{predicted}\ 99\ IND_i\ \textit{using data in}\ 97)$$

$$R^2 = 0.001 \qquad \overline{R}^2 = -0.036$$

The standard errors of coefficients are in the parentheses. Coefficients in regressions *b* and *c* are not significant, and the coefficient in regression *c* has a wrong sign. The regression *a*, in which the coefficient is significant and shows the right sign, implies the causes of Mexican and East Asian crises may be similar.[40]

3.1.4 Other fundamental determinants

In addition to *rer* and *lb*, we can add some fundamental variables and factors stressed by other literature, including current account (*CA*), capital flows (*K*, including short-term external debts, *STD*), and interest rate differentials (here we use real interest rate differentials, *RIRD*), government consumption (*GC*), investment efficiency (*IE*), and share prices (*SP*), to see whether they are also important factors in the crises. We measure each concept (except *RIRD* and *SP*) in two ways: as the average ratio to *GDP* over the four years prior to the onset of the crisis, and as the real percentage change during the same periods. Note that we deal with short-term external debt in three ways (*STD*/

[40] This empirical result supports the argument by H. N. Peng, president of Central Bank of Taiwan (1995). However, Furman and Stiglitz (1998, pp. 47-48) did a similar test and argued that policymakers would not get any useful guidance about the depth and scope of the impending crises using this approach.

total external debt, *STD/GDP*, and changes in *STD* within one year) due to its short-term characteristic.

We only show the results of the real percentage change version in Tables 3-4 because of the unsatisfied performance of the other version. The coefficients of *CA*, *K*, *RIRD1*, *RIRD2* and *STD* are significant and have expected signs. And the coefficient of *SP* in Table 4 shows *SP* may spread its effects through *lb* and *rer*. Note that the performance of *RIRD1* and *RIRD2* shows emerging markets experienced loose monetary policies before crises happened, though levels of real interest rates in these economies were still higher than that of the United States. The results of the Wald test (except *RIRD1* and *STD*) also tend to support the idea of the non-domestic fundamental issue or multiple equilibria.

3.1.5 International propagation effect caused by fundamentals or others

Our empirics show evidence that a country may still suffer from a currency crisis even if it has strong fundamentals, it is necessary to discuss the role of the international propagation effect. That is, two main effects may measure our crisis indices (*IND*): one is the ***direct effect*** represented by economic variables, the other is the ***marginal effect*** shown by international propagation mechanisms caused by fundamentals.[41]

International propagation mechanisms can be caused by either economic (e.g., trade, financial, other fundamental factors) linkages or non-fundamental factors (e.g., location of a country). The first step is to define which countries experienced a crisis within the same period. We still use monthly *IND* by a standard definition of empirical literature on currency crises

$$IND_{i,t} \le \overline{IND}_i - 1.5 \times \sqrt{V_{IND_i}} \qquad (11)$$

Table 5 presents the countries that experienced crises during each episode.

Following a similar idea of Ahluwalia (2000), we construct three "international propagation indicator" variables, which measure the effect of international propagation based on economic variables. Then we add these new variables into our empirical model to see if they will raise the explanatory power of the model. We use eight annual variables: (1) normalized real exchange rate (*NRER*, 1990=1); (2) lending over GDP (*LBGDP*); (3) broad money over reserves (*M2R*); (4) current account situation over GDP (*CA*); (5) changes in share prices (*SP*); (6) short-term external debt over GDP (*STD*); (7) real interest rate differentials (*RIRD2*); and (8) export growth (*EX*). Most of these macroeconomic

[41] See Ahluwalia (2000).

variables are widely used in the empirical literature on currency crises, such as Kaminsky et al. (1998), Sachs et al. (1996), and Bussiere and Mulder (1999). We adopt these variables and make some changes for convenience.

According to the idea of "leading indicators" in Kaminsky et al. (1998), a macroeconomic variable should be signaling a crisis if it crosses a certain threshold value in its percentile distribution over time in a given country. The threshold value is the same across countries for a given variable and is set between the eightieth and ninetieth percentile, or the tenth and twentieth, depending on whether high or low values of the variable are supposed to signal a crisis.[42] Here we follow Ahluwalia (2000) using the 20% threshold for all variables and use the data over the period 1990-98 for all countries. Then we will test the results of robustness using a 10% threshold.[43]

Following the above methodologies and definitions, we construct three variables: propagation by **fundamentals** (*PF*), propagation by **fundamentals and location** (*PL*), and propagation by the so-called **wake-up call** (*WU*).[44]

$$PF_{j,t} = \sum_{q=1}^{32} [CRI_{q,t} \times [I[\sum_{i=1}^{8} \{I(X_{i,j,t} \geq \overline{X}_{i,j}) \times I(X_{i,q,t} \geq \overline{X}_{i,q})\} > 0]]] \qquad (12)$$

Here q denotes the 32 countries other than country j for which the observation is being taken. I is a function which takes the value 1 if the condition that is its argument holds, and zero otherwise. *CRI* is a dummy which takes the value 1 if country q experienced a crisis during episode t, and zero otherwise. $t \in (1994, 1996, 1998)$. X denotes macroeconomic variables we mentioned earlier. The $\overline{X}_i$ are threshold levels set such that 20% (or 10%) of the values of a given variable for a given country over the relevant interval would be considered signals.

The *PL* is constructed by the same principle as the *PF* except a regional factor

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[42] For the real exchange rate misalignment, for example, we can estimate a percentile threshold of 90%. That is, when a country's real exchange rate is within the highest 10% of its experience of overappreciation, it signals the possibility of a crisis. Furman and Stiglitz (1998, p. 44) criticized that the most serious of theoretical drawbacks in this approach is the omission of the fixed effect specification in the East Asian case, which leads to overpredict (underpredict) crises in countries with good (bad) histories and causes a lot of noisy signals.

[43] The 20% (10%) threshold means we can choose two values (one value) for all variables.

[44] Note that we have explained the "wake-up call" hypothesis in Section 1.

$$PL_{j,t} = \sum_{q=1}^{32} [(CRI_{q,t} \times DR) \times [I[\sum_{i=1}^{8} \{I(X_{i,j,t} \geq \overline{X}_{i,j}) \times I(X_{i,q,t} \geq \overline{X}_{i,q})\} > 0]]] \quad (13)$$

Where *DR=1* if both j and q locate on the same region (e.g., East Asia or Latin America). The third variable is to test the assumption of a "wake-up call," which means investors are "awakened" to weakness in a country by a currency crisis in that country, and look for similarities between that country and other countries, to decide which one could be vulnerable. It is natural to choose Mexico in 1995, Thailand in 1997, and Brazil in 1999 as our "ground-zero"[45] countries.

$$WU_{j,t} = \sum_{i=1}^{8} [I(X_{i,j,t} \geq \overline{X}_{i,j}) \times I(X_{i,q,t} \geq \overline{X}_{i,q})] \quad (14)$$

Where q means our ground-zero countries. Hence the WU measures the number of signals each country has in common with the ground-zero country.

Here we do not show the details but give an example: the signaling variables of Hong Kong are *NRER* and *EXP* in the 1997 Asian crisis. There are 9 countries suffering crises in 1997 (See Table 5). So the *PF=9* since South Korea, Malaysia, the Philippines, Thailand, Singapore, and Chile have the same signaling variables. The *PL=8* since the EX of Chile should be excluded. And *WU=2* because of the same signaling variables as those of Thailand.

We construct a new model based on (9). Note that the variable *PF* can be replaced by *PL* or *WU* because of the multicollinearity.

$$\begin{aligned} IND_{i,t} = {} & \beta_0 + \beta_1 \times rer_{i,t} + \beta_2 \times lb_{i,t} + \beta_3 \times rer_{i,t} \times DHR_{i,t} + \beta_4 \times lb_{i,t} \times DHR_{i,t} \\ & + \beta_5 \times rer_{i,t} \times DSF_{i,t} + \beta_6 \times lb_{i,t} \times DSF_{i,t} + \beta_7 \times PF_{i,t} + \varepsilon_{i,t} \end{aligned} \quad (15)$$

Tables 6-7 show the results using 33 countries sample. The coefficients of new variables are significant at the 10%, but are insignificant at the 5% and 1% levels in Table 6. Table 7 shows that significant coefficients in Table 33 are not robust, except *WU*. It seems that the assumption of international propagation in recent crises is not strongly supported by empirics based on (15).

How to explain the above results? Recall that we establish *PF*, *PL*, and *WU* using fundamental variables. The insignificance of these variables means that international propagation mechanisms caused by fundamentals had not played an important role for spreading currency crises in the 1990s.

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[45] Ahluwalia, p.10.

That is, the multiple equilibria and the contagion effect caused by non-fundamentals (or the so-called "pure contagion") may matter in the recent currency crises. We need to establish a further empirical method to test the above issue.

To conclude in this section, our findings suggest that weak fundamentals and low international liquidity may cause currency crises. On the other hand, a country may still suffer the crises even if it has strong fundamentals or high reserves. That is, we cannot neglect the possibility of multiple equilibria in the domestic economy and other factors from foreign economies.

3.2 Similarities Between Cases of Europe and Emerging Markets

It seems that the empirical results explaining the cases of emerging markets are not appropriate to apply to those of developed countries, such as the ERM crisis in 1992-93. However, it may not be the case. Eichengreen (2000) follows the early warning approach invented by Bussiere and Mulder (1999),[46] but in a reverse way. He uses coefficients from the empirics of emerging market crises from 1994 to 1999 and computes the crisis indices of ERM members in 1992-93. He does a surprisingly good job to "predict" which Western European countries experienced the exchange market pressure at that time. Therefore, he claims that some similarities do exist between the ERM crisis and emerging market crises. In spite of definition and method differences between our work and Bussiere and Mulder's, it is not a problem for us to do the ERM test in Eichengreen's reverse out-of-sample approach.

Recall the fact that in 1992-93 speculators first successfully attacked Finland, the United Kingdom, Sweden, and then Italy, Spain, and Portugal.[47] They are also consistent with our real crisis indices (see Table 8, column *IND*).[48] After that, we use the coefficients of economic variables in our 33-country benchmark equation (see Table 2, column 1) to compute different crisis indices. All definitions of the variables here are the same as those in the previous analysis of emerging markets in order to make both cases comparable[49] (except the different starting and ending points of calculation[50]). Note that the

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[46] There are five main indicators in their work: current account over GDP, export growth, changes in foreign reserves, the deviation of the real exchange rate from trend, and short-term foreign debt relative to reserves. All these indicators are all lagged one year.

[47] All currencies of EU members were attacked except Deutsche Mark and Dutch Guilder, but speculators failed to attack some of the currencies due to governments' immediate response (e.g., Danish raised its interest rate) or foreign supports (e.g., Germany supported French Franc). See Eichengreen and Buiter et al. (1998).

[48] Here we add Switzerland and Norway, which are not the members of EU, to our computation to show the contagion effect.

[49] The exceptions are exchange depreciation and real interest rate differential, in which Germany is the central country instead of the United States. Such changes in definition can be logical, considering the leadership of Germany in the European

six European countries, which seriously suffered from the ERM crisis, are marked by grey color in Table 8.

Recall high negative value of a country's crisis index does not mean that the currency crisis must happen, but that the country faces high pressure and high probability of a currency crisis. We can draw some important conclusions as follows after looking at the results shown in Table 8:

First, real exchange appreciation and lending boom, two crucial fundamental variables in our empirical model, still matter when explaining the causes of crises in Spain, Italy, Sweden, the United Kingdom, and Finland (column *INDREXLB*). In other words, the emerging market cases precisely "predict" 83.33% of the ERM crisis in 1992-93. That is, real exchange appreciation and high lending growth may be treated as common fundamentals of currency crises in the world economy during the 1990s, whether a country is classified as an emerging or a developed economy.[51]

Second, the result we get from column *INDREXLB* does not change much after adding other economic variables except changes in real interest rate differentials, *RIRD1*. Note that we get the best result after adding changes in government consumption (column *INDGCC*) to our benchmark, in which six countries seriously suffering from the crisis are all on the top rank. That is, as Buiter et al. and Eichengreen argue, the fiscal effects stimulus as governments sought to avoid importing recession from the United States in 1991-92. Also, Italy, Spain, and Portugal still remained their high-level fiscal deficits.

Naturally, our empirical model for the emerging economies cannot fully take account of some important economic conditions in Europe, such as unemployment rates, economic recession, and inflation rates, which are not so significant in most cases of the emerging markets.[52] On the other hand, those common fundamental characteristics between developed and emerging economies are not the necessary or sufficient conditions for a country to suffer from a currency crisis in the future. However, the common characteristics between the ERM and emerging market cases in the 1990s show

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economic integration.

[50] 1991 and 1992 are the starting and ending points of calculating crisis indices, respectively. Moreover, 1987 is the starting point of computing economic variables since Single Market Agreement was signed in 1986, which caused exchange realignment to be problematic.

[51] This does not mean that there exists causality between economic variables and currency crises. Note that the problem of external debt does not matter to European advanced economies but to emerging economies, so the out-of-sample in reverse prediction of the external debts is not available in the ERM crisis.

[52] For instance, the dummies should be defined by unemployment, inflation, fiscal deficits, and so on. Yeh (1999) tries to define the dummies according to the above conditions.

the high probability that a country with current external imbalance and fragile financial systems may face a speculative attack in the near future.

4. What Have We Learned from the Past?

In the above subsection we have shown some economic fundamental characteristics in the 1992-93 ERM chaos, but the performance of macroeconomic fundamentals, core of the first generation model, is not sufficient to explain why the ERM worked well in the first half of the 1980s but finally failed in 1992-93. Other explanations such as the removal of capital control in 1987 and market expectations which caused self-fulfilling speculative attacks, the main points of the second generation model, also matter in the ERM case.

It seems that to keep exchange rate stable and to liberalize capital control were incompatible.[53] Since the second half of the 1980s,[54] the EMS has showed the difficulty of pegging exchange rates in a world of high capital mobility.[55] However, as a system of collective pegs and cooperative managements, the EMS should be more stable than a unilateral peg, such as Mexican peg before 1995 and current Hong Kong's and Argentina's pegging systems. That is, unlike the situation in countries with unilateral peg, the main cause of the ERM crisis in 1992-93 would not be either fundamentals or market expectations but the failure of collective cooperative mechanism.[56] This is why Eighengreen makes a such comment: "…incentive institutional problems prevented ERM members from responding to pressures in a coordinated fashion. If Europe could not fitness these difficulties, it is hard to imagine that East Asia or Latin America could do better."

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[53] This is the so-called "impossible trilogy principle," which means only two of the three following features are mutually compatible: full capital mobility, independence of monetary policy, and fixed exchange rate. See Wyplosz (1997).

[54] Giavazzi and Giovannini (1989) believe that exchange stability was rooted not only in a desire for monetary and financial stability but also in a commitment to economic and political integration. It is hardly to operate the Common Agriculture Policy (CAP) and prevent competitive-devaluation among members of the EU without exchange stability. On the other hand, the removal of border controls is also helpful to create a single labor market and a single financial market. Both policies are considered the presumptions of achieving economic and monetary integration. However, they seem to be incompatible in the exchange stability.

[55] Buiter et al. and Eighengreen argue that the eleven realignments of the EMS from 1979 to 1987 were successful owing to the breathing space provided by capital controls. After Single Market Agreement in 1986 combined by the narrow-band EMS, no realignment was feasible until the crisis happened in 1992-93.

[56] The history and the logic of such a analysis are provided by Buiter et al.

The experience of currency crises happening in the 1990s should be valuable for those countries interested in establishing a monetary and exchange mechanism to resist future speculative attacks.[57] In addition to keeping strong macroeconomic fundamentals and institutional convergence, economies with the same goals and interests have to overcome the same problem of cooperation such as the ERM case in 1992-93.[58] It would be a topic for future research.

5. Economic Monetary Co-operation: A Choice to Prevent the Next Crisis?

Simply speaking, strong fundamentals with capital controls should be the main reason for China to prevent suffering from the currency crisis in 1997:

A. Strong economic growth and huge current account surplus are helpful to attract foreign direct investment (FDI), which in turn supports growth and economic reform and offset the negative effect caused by capital flights.

B. Almost 90% of Chinese foreign debts are medium-term or long-term, which are borrowed from international organization (e.g., World Bank). That is, short-term debt, a fuse of Asian financial crisis, is not a problem for China because of the capital controls (See Table 9, column 4 and 5).

However, Chinese authorities still have to solve following problems:

A. The bad loans of banking system, which are mainly caused by State-own enterprises (SOEs), should be solved as soon as possible by pushing the privatization of financial sector and SOEs.

B. Finishing a completed exchange and financial market before fully capital account liberalization. This should be helpful to solve the problem of capital flights

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[57] A common currency seems impossible in Asia due to not only complicated political problems but also criteria of optimal currency area (Mundell, 1961; Mckinnon, 1963; Kenen, 1969). Some economists believe the ERM style may be the second best choice. For example, R. Mundell (2000.6.13, *Chinatimes*), the 1999 Nobel Prize winner, argues that the idea of an international currency system does not imply that Asia should have a single currency. If all currencies peg and exchange an international currency directly, then all countries can still keep their own currencies and do not need to establish a single currency. Wyplosz (2001) claims European postwar experience with fixed exchanges rates should be useful for today's emerging economies. Recently officials in Central Bank of Taiwan advocate certain kinds of financial cooperation with Mainland China (*Chinatimes*, 2000.12.18).

[58] Buiter et al. (p.18) comment: "Even if a country were able to satisfy the Maastricht criteria exactly, it could still be vulnerable to speculative attacks…a crisis of an exchange rate system is a symptom of insufficient or ineffective policy coordination."

C. The theory of "multiple equilibria" has shown us that strong fundamental is not an absolute promise to prevent suffering from speculative attacks. Other countries' situation also matter for China to stay out currency crises.

From the above points of view, we are convinced that Chinese large market and strong economic growth are advantages to keep foreign capital inflows, which in turn pushes economic growth and institutional reform. However, from the theory of multiple equilibria we know that some negative conditions, which may increase the pressure of speculative attacks, cannot be controlled by China. That is, it is impossible to eliminate those negative conditions without international co-operation. In fact, some Asian politicians have drawn their attentions to this issue because of the unsatisfied performance of IMF and APEC during the Asian crisis (See Table 10). It is still unclear whether the idea will be feasible in the future, but it is a good topic to explore not only for politicians but also for economists.

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Table 1 Ascending rankings for the fundamentals of Asian economies

Fundamentals	Country rankings*						
	1	2	3	4	5	6	7
External situation							
Foreign reserves	S	H	K	T	M	I	P
Current account / GDP	S	H	I	P	M	K	T
Debt / GDP	S	H	K	M	I	P	T
Export slowdown	I	P	H	K	M	S	T
Real exchange rate deviating from PPP	P	I	T	M	H	K	S
Liquidity problem							

Excess credit growth	H	K	S	I	T	M	P
Short-term external debt / Foreign reserves	S	H	M	P	T	I	K
Broad Money / Foreign reserves	H	S	M	K	P	I	T
Banking strength							
Capital adequacy	S	H	P	M	I	T	K
Non-performing loans	H	S	P	I	K	T	M
Bank ratings	S	M	H	P	T	K	I
Overall average**	H	S	M	P	K	I	T

Note: * H: Hong Kong, I: Indonesia, K: S. Korea, M: Malaysia, P: Philippines, S: Singapore, T: Thailand.
**Equal weights to all fundamentals.
Source: Goldstein and Hawkins (1998)